What's Your Watershed Address?

Easy ways to demonstrate how water flows through a watershed

Grade Levels: 3-6

Science SOLs:
3.9, 4.8, 6.11

Materials:
- **A map of your local area showing streams (topographic is good but not essential)**
- **Paper and markers**
- **Paint trays (1-2)**
- **Aluminum foil, or a white shower curtain**
- **Rocks, or blocks**
- **A powdered "pollutant," such as cinnamon or Kool Aid or cocoa**
- **Sponges and small toys**

Objectives:
Students will be able to predict where water will flow in watersheds, describe drainage patterns in watersheds, and identify sources of pollution.

Vocabulary Words:
erosion
groundwater
hydrologic cycle
nonpoint source pollution
nutrients
pollutants
runoff
water pollution
watershed

Watershed Background

A watershed, also called a drainage basin, is a geographic area in which water, sediments, dissolved minerals and other pollutants, including trash, drain into a common body of water. While we all reside in one, many of us do not even know its name. There are nine distinct watersheds or river basins that lie within the state of Virginia. They are from south-west to north-east: The Tennessee-Big Sandy, the New, the Roanoke, the Chowan, the James, the Potomac-Shenandoah, the Rappahannock and the York. The James River is the largest watershed. It includes all or parts of 39 counties and 18 cities and drains one-fourth of the state's land area into the Chesapeake Bay.

Discuss the concept of a watershed and how water travels over and through the land. Students may wonder where water goes after it flows down the street during a heavy rainstorm. Make the connection between people living in the watershed and the impacts that they have upon water quality; specifically, non-point source pollution. Provide some examples of how the actions and behaviors of individuals (including pets and their owners) and businesses in your area affect the water quality of your local watershed and the body of water into which the watershed drains, such as the Chesapeake Bay. Don't forget to include sewage treatment plants, homes, commercial developments, and factories.

Discuss the speed at which water flows and how moving water changes the land. You can refer to the branches on a tree, or the veins in a leaf, or the human nervous system to describe how bodies of water "branch out" with smaller branches analogous to streams branching into larger ones, such as rivers, and so forth. Explain that watersheds can be open or closed depending on where the water drains. In closed systems, there is no outlet for the water, so it leaves the system naturally by evaporation or by seeping into the ground (becoming groundwater). In open watershed systems, such as those found in Virginia, water eventually flows into outlet rivers or a bay and, ultimately, the sea.

Activities

There are numerous ways that students can build a model of a watershed, ranging from individually constructed models made of paper to larger scale models created by using a shower curtain or tarp. Here are some easy ways to demonstrate topography and the action of water flowing through a watershed:

1) *Students use crumpled paper to create a miniature watershed model:* Crumple a piece of paper into a tight ball. Gently open up the paper, but don't flatten

it out completely. The highest points on the foil or shower curtain represent the mountain tops and the lowest wrinkles, the valleys. Choose one color of water soluble marker and use it to mark the highest points on the map. These points are the mountain ridge lines. Choose a second color and mark the places where different bodies of water might be: creeks, rivers, and lakes. With a third color, mark four or five places to represent human settlements: housing tracts, factories, shopping centers, office buildings, schools, etc. Try sprinkling a powdered material, such as cinnamon, red pepper, or cocoa powder, to demonstrate how pollutants flow through the watershed. Use spray bottles to lightly spray the topographic watershed maps. The spray represents water falling into the watershed.

Drainage Divide

2) *Or, you can use a paint tray to create a slightly larger model:* Place small rocks or other objects on the tray, and cover the tray with aluminum foil or a white garbage bag. Use spray bottles to represent rain. Sprinkle powdered materials such as cinnamon, Kool Aid, or cocoa powder to represent how pollutants flow through the watershed. Place sponges at the bottom of the watershed to represent wetlands that help clean the water. To show how wetlands help to hold and clean water, you could conduct a test (either using two paint trays or one paint tray with two different scenarios) to see which watershed drains more quickly and how much water reaches the end of the tray. In either case, measure the water before you spray it into the watershed and again, afterwards. You could also time the contest.

3) *Or, create a large watershed using a white vinyl shower curtain:* Place some objects such as buckets and boxes, or even a chair (lying on its side), under the shower curtain or plastic tarp to represent the mountains and follow the steps listed above for the paint tray model. This scenario is best done outdoors! You can also add some small toys to represent land uses (cows and tractors to represent farms, cars and people or houses for residential areas, a bulldozer for development; use your imagination).

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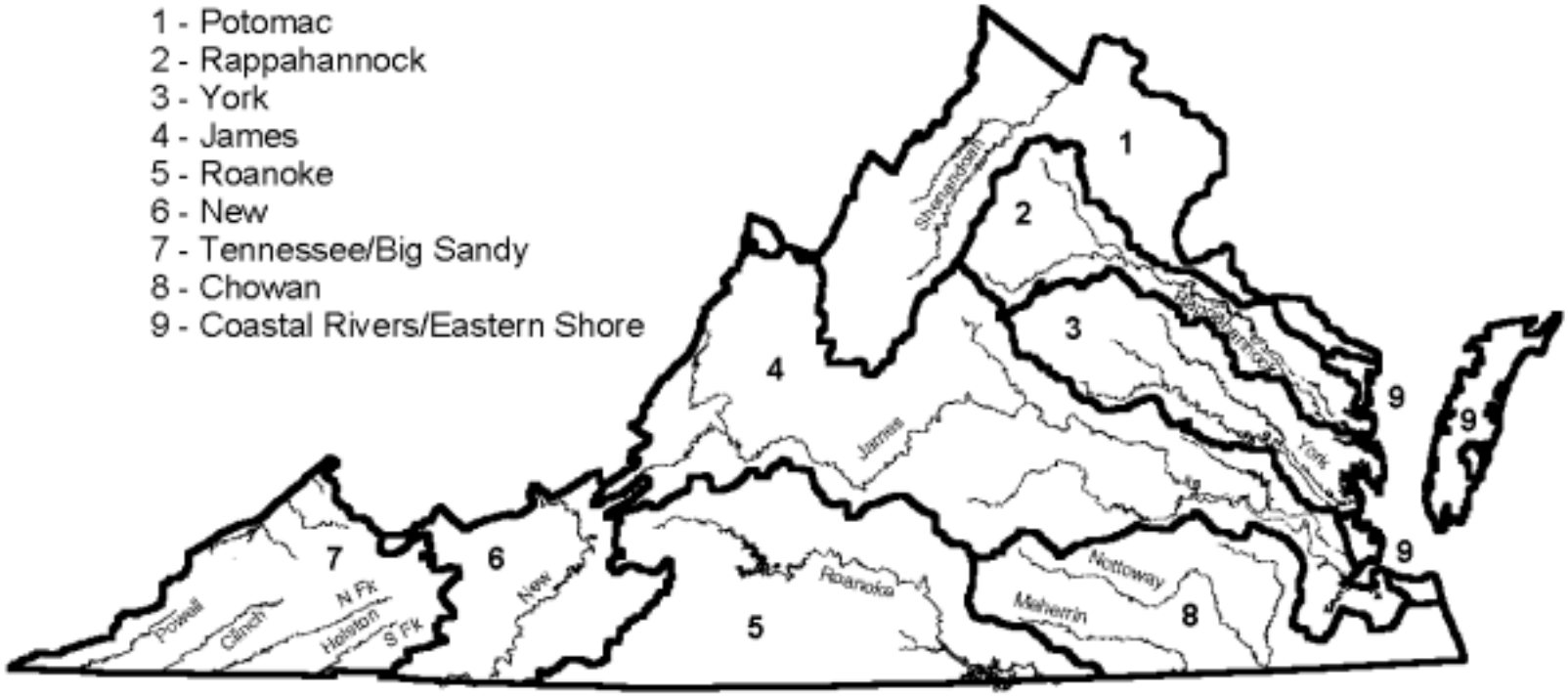
Discussion

1) Discuss how the water travels through the system.
   - u What changes do you observe in the "paper" watershed maps?
   - u Where does erosion occur?
   - u What happens to human settlements -- are any buildings in the way of a raging river or crumbling hillside?
   - u How does the flow of water through the watershed affect choices for building sites?
   - u What happens to the "pollutants," -- where do they end up?
   - u What factors may lead to increased pollutants such as run-off from sediments, industrial wastes, phosphates and nitrates from agricultural sources, sewage, and residential runoff including pesticides.
   - u What are some ways to reduce or prevent these "non-point" source pollutants?
2) Use the accompanying map to identify the river basin or "Watershed Address" of your community.

River Basins in Virginia

1 - Potomac
2 - Rappahannock
3 - York
4 - James
5 - Roanoke
6 - New
7 - Tennessee/Big Sandy
8 - Chowan
9 - Coastal Rivers/Eastern Shore



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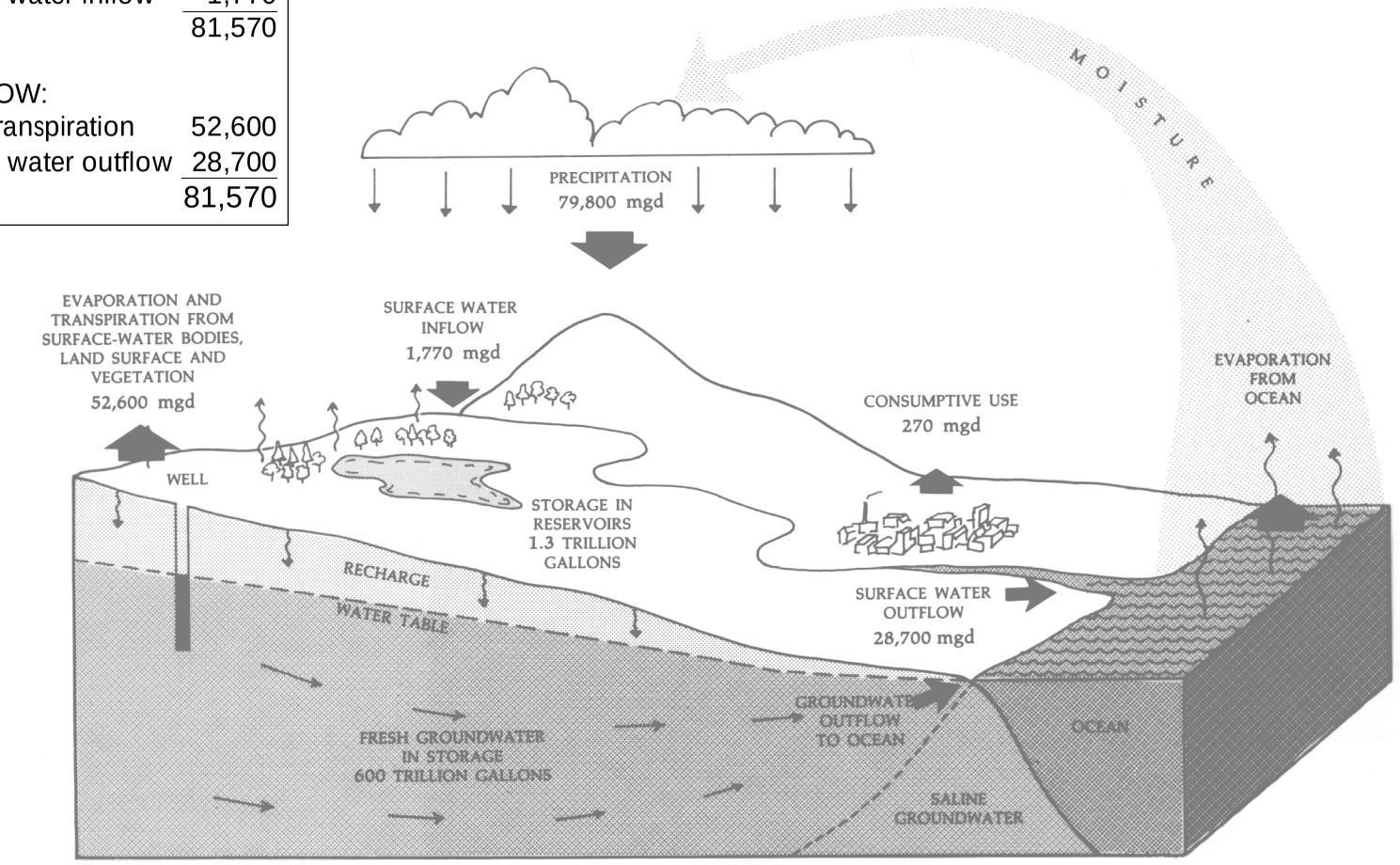
Hydrologic Cycle and Water Budget

Virginia's Water Budget Analysis
(Year 1985; in million gallons per day)

INFLOW:	
Precipitation	79,800
Surface water inflow	1,770
	81,570
OUTFLOW:	
Evapotranspiration	52,600
Surface water outflow	28,700
	81,570



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